

Current Implementation of the Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS)



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MOTEMS CODE REVISIONS

- ◆ **Revision 0 has been effective since February 2006.**
- ◆ **Revision 1 will be effective 1 January 2011.**
- ◆ **All MOTEMS related work must comply with the MOTEMS version in effect at the time of submittal, provided that construction begins within 1 year.**



RISK CLASSIFICATION OF CALIFORNIA MOTs

- ◆ **11** “HIGH” Risk MOTs
(Initial Audits due August 6, 2008)
- ◆ **17** “MEDIUM” Risk MOTs
(Initial Audits due February 6, 2010, reviews in progress)
- ◆ **3** “LOW” Risk MOTs
(Initial Audits due February 6, 2011)
- ◆ **?** New “HIGH” Risk MOTs
(Initial Audits due within 3 years of commencement of operations –
MOTEMS § 3102F.3.3.1)



INITIAL AUDIT RESULTS

(High and Moderate Seismic Risk)

1. Structural issues - associated with ordinary operations.
2. Seismic issues - when subjected to the Level 2 return period earthquake.
3. Soil failures - liquefaction or significant slope movement associated with the Level 2 earthquake motion.



INITIAL AUDIT RESULTS – Ordinary Operations Issues

1. **Almost all terminals have structural issues associated with ordinary operations (Modify Terminal Operating Limits):**
 - ◆ Reduce Operating Wind Limits
 - ◆ Terminate Operations if Current Exceeds capacity of facility
 - ◆ Reduce Operating Impact Velocity (with device to measure compliance/non-compliance)
 - ◆ Reduce Vehicular Traffic
 - ◆ Reduce Vessel Size
 - ◆ Other?



INITIAL AUDIT RESULTS – Seismic Issues

2. **Almost all terminals have seismic issues, when subjected to the Level 2 return period earthquake:**
 - ◆ Per MOTEMS, determine a rehabilitation schedule that is mutually agreed upon by MFD/CSLC and the operator.
 - ◆ Continue operations and meet rehabilitation deadlines.
 - ◆ Reduce oil at risk with additional valves, changes in pipeline configurations, etc.



INITIAL AUDIT RESULTS – Geotechnical Issues

3. **Some terminals have liquefaction, soil failures, slope movement associated with the Level 2 earthquake motion.**
 - ◆ MFD/CSLC will review/request changes, on a case-by-case basis.
 - ◆ Reduce oil at risk.
 - ◆ Design structure to carry soil kinematic loads.
 - ◆ Other?



MOTEMS REVISION 1 (Some Examples)

- ◆ Tsunami height to be added to “mean high tide”
- ◆ Slight changes to load combinations
- ◆ Retaining walls – peer review not always required
- ◆ In-ground hinge strain levels modified for Level 2 seismic performance criteria



MOTEMS REVISION 2

(Start in 2011, complete in 2012)

- ◆ **ES 1 and 2 tables will be updated.**
- ◆ **Simplified approximate methods to evaluate capacity/demand using “displacement ductility” approach of Prof. R. Goel.**
- ◆ **Add allowable non-linear behavior of pipelines (Level 2 seismic demand, B31E).**
- ◆ **Update Division 6 (Geotechnical Hazards and Foundations).**
- ◆ **Technical Advisory Group (TAG) starting 2011.**



MOTEMS IMPLEMENTATION TODAY

- ◆ Letters to operators (high and moderate risk) informing them to start using the TOLs from their MOTEMS audits. Reviews are in progress.
- ◆ MOTEMS impact velocities – long term rehabilitation to values in Table 31F-3-9, with the assessment values of Table 31F-2-5.
- ◆ Velocity monitoring equipment - “interim” solution.
- ◆ Operations/training in place?



Future MOTEMS Audits

- ◆ If no changes, no significant degradation, initial analyses should not have to be repeated.
- ◆ New analyses - if larger vessels, significant additional mass, significant structural degradation, new piping systems, etc.
- ◆ Reasonable re-inspection of topsides.
- ◆ Review/update of MOTEMS deficiencies and rehabilitation.



Rehabilitation Schedules

- ◆ In general, all MOTEMS upgrades should be completed within 5 years of the initial audit.
- ◆ Future audits will track completion of ES-2 deficiencies.
- ◆ MFD Engineering will track schedules and completion with the new Excel ES-1 and ES-2 tables.



Additional Questions & Comments? MOTEMS Revision 1 is on the CSLC/MFD Website

MFD Engineering website:

http://www.slc.ca.gov/Division_Pages/MFD/MFD_Home_Page.html

Thank you and enjoy PF 2010.